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ONTARIO LAND USE CLASSIFICATION

ACTIVITY AND STRUCTURE

FOR DISCUSSION
PURPOSES ONLY



Ontario

MINISTRY OF TREASURY

ECONOMICS AND

INTERGOVERNMENTAL AFFAIRS

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Ontario Land Use Classification

The attached discussion paper presents a standard set of definitions and criteria for two primary series of land use -- activity and structure.

The goal was to develop a procedure whereby planners across the Province of Ontario would have available to them a common classification for land use. The merits of such a process for the Province, municipalities, and other interested parties can be readily appreciated. Data could be gathered uniformly for a particular study area, municipality or province-wide, thereby providing a means for the exchange of information and comparisons.

Selected field tests were conducted in the City of Toronto (urban), the Regional Municipality of Waterloo (rururban), and the Regional Municipality

the approach in the summer of 1975 and develop a procedural manual.

Work to date has been reviewed by a committee representing a variety of Ontario planning offices and disciplines. This publication was prepared as a discussion paper and *your comments and suggestions pertinent to the land use classification would be greatly appreciated.*

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PURPOSE

The Ontario land use classification evolved from an abstract to a practical model. We assumed, having identified the deficiencies of present classifications, that an acceptable model could be developed from a theoretical approach. This report presents some of the results of that approach.

At the outset, a classification consisting of four land use series was developed for the province. These included the basic components of land use: *activity* -- perceived changes to the land unit; *structure* -- physical alterations to the land; *function* -- linkage to adjacent land between activities and structures; and, *effect* -- constraints arising from specific types of land uses. The series were then reviewed by a committee of planning practitioners from consultant firms, municipalities, and the province.

The evaluation produced a modified classification which was field tested with the help of specialists in agriculture and assessment. The results showed the structure and the activity series to be reasonably reliable.

The purpose of this report is to advance the development of an efficient, uniform land use classification for Ontario.

We hope planners, both practitioners and students, will experiment with this proposed classification and tell us about their findings. We invite the comments and participation of all those interested in a standard land use classification.

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October, 1974

ACKNOWLEDGEMENTS

Much of the work on this Ontario land use classification was drafted by project planner Frank Watty, who developed it from an approach suggested by the Land Use Study Advisory Committee, Town Planning Institute of Canada. This report is primarily the work of project planner S. E. (Ted) Foster.

We are also indebted to the efforts of the Land Use Classification Review Committee whose members contributed individually and collectively to making the classification operationally significant. Similarly, the contributions of those who assisted in the field testing are gratefully acknowledged.

M. H. S.

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CHAPTER 1

INTRODUCTION

Background

The need for more and better data on land use is a matter of great importance in urban and regional planning. The growing interest in developing analytical techniques and models for examining, simulating, predicting, and controlling community change processes has emphasized this need. At the same time, the problem of manipulating and evaluating large quantities of data has been partly overcome by advances in storage, analysis, and display techniques using electronic data processing facilities.

Current land use information systems vary widely in their methods of compiling and organizing data as between municipalities, provincial departments, and special collection agencies, including planning consultants. The result has been a duplication of effort in data collection and the emergence of various series that provide little basis for comparison. These series are often inconsistent in definition, which poses problems for in-depth comparisons. Consequently, basic to the emergence of an improved and expanded land use data system is the design and general adoption of a standard method for classifying land use.

Attempts have been made in several countries to design systems appropriate to their own circumstances. In the United States, under the joint sponsorship of the Urban Renewal Administration and the Bureau of Public Roads, a

prototype system has been widely adopted with modification by many regional and local agencies.

In Britain, the City of Coventry has designed a master file as the basis for an updatable system that stores all property data required by a local planning authority. The land use description for the property is an important component of this file. Along with this individual effort is the work of Britain's Study Team to Develop a National Land Use Classification, set up by the Ministry of Housing and Local Government.

In Belgium, one study proposal identifies the need for establishing a standard recording system. This general interest is shared by several other European countries.

The Canadian situation has already been well documented and possible directions for its solution have been proposed by the Land Use Study Advisory Committee of the Town Planning Institute of Canada.*

Still, the number of disparate systems is growing yearly and, in view of this increasingly complicated problem, some firm direction appears overdue.

In the absence of any national effort at this time, the current study is confined to the problems and needs of the Province of Ontario.

The Nature of Land Use

There are likely as many definitions of the term "land

* Town Planning Institute of Canada, Land Use Study Advisory Committee. "Land Use Classification and Coding in Canada: An Appraisal." Ed. by Gerald Hodge and Robert W. McCabe. *Plan Canada*. (June 1968).

use" as there are systems for classifying it. Generally, though, land use can be said to describe the process by which land as a resource is modified through the spatial interaction of man and land. Physical assets, since they are incapable of providing a product or a service, possess no real land use significance.

This process of interaction* takes place by:

- modification of human action occurring on a spatial unit (space - behavioural);
- changes in the location of actions from one unit to another (space - locational);
- changes in use-potential of a unit due to changes in space resource (space - developmental);
- adjustments in mode of linkages between units (channel - behavioural);
- changes in patterns of location of linkage arteries (channel - locational);
- improvements in capacity of arteries for whatever mode is desired (channel - developmental).

These processes document land use according to two basic perspectives: those which act upon or respond to the physical environment -- behavioural and locational -- and those which result in a physical improvement upon the land -- developmental.

* McLoughlin, J. Brian. *Urban and Regional Planning: A Systems Approach*. London: Faber and Faber, 1969.

The distinction is translated into the concepts of *structure* and *activity* as observable behavioural, locational, and developmental adjustments.

The relationships between the structure and the activity are designated as *function*. Function defines operational units as dominant, complementary, and/or dependent relationships.

In their efforts to understand the community and to allocate land among competing developmental and locational possibilities, planners must analyze the following major elements:

1. *Structures* - the development and adaptation of buildings, constructions, and improvements;
2. *Activities* - human actions perceived by improvements or modifications to the land resource unit;
3. *Functions* - interactions and linkages between structures and activities on land use parcels that relate to adjacent and surrounding parcels;
4. *Impact or Effect* - a land use description which identifies constraints to the type or quality of land use on surrounding land units arising from specific types of land uses.

Objective of Research

The primary purpose of this research project is to design a comprehensive method for classifying land use which would reveal as much information as possible on use characteristics necessary for planning. There are two

DEFINITION

Land Use

The complex of actions, structures, and processes on a parcel, which form part of purposeful human adaptation. These should be examined in terms of frequency of occurrence, number of persons participating, and degree of alteration to the original landscape resulting from such use.

CRITERION

To describe "land use" in terms of its observable and underlying characteristics so that parcels with similar attributes may be similarly grouped. Among the bases for parcel description are:

1. factors relating to character of land,
2. observable action on land,
3. structures and improvements,
4. processes and effects generated by use of land,
5. linkages among parcels arising from complementary activities.

CODE

SERIES

Parcel
Structure
Activity
Function
Effect

S
A
F
E

Figure 1: Land Use

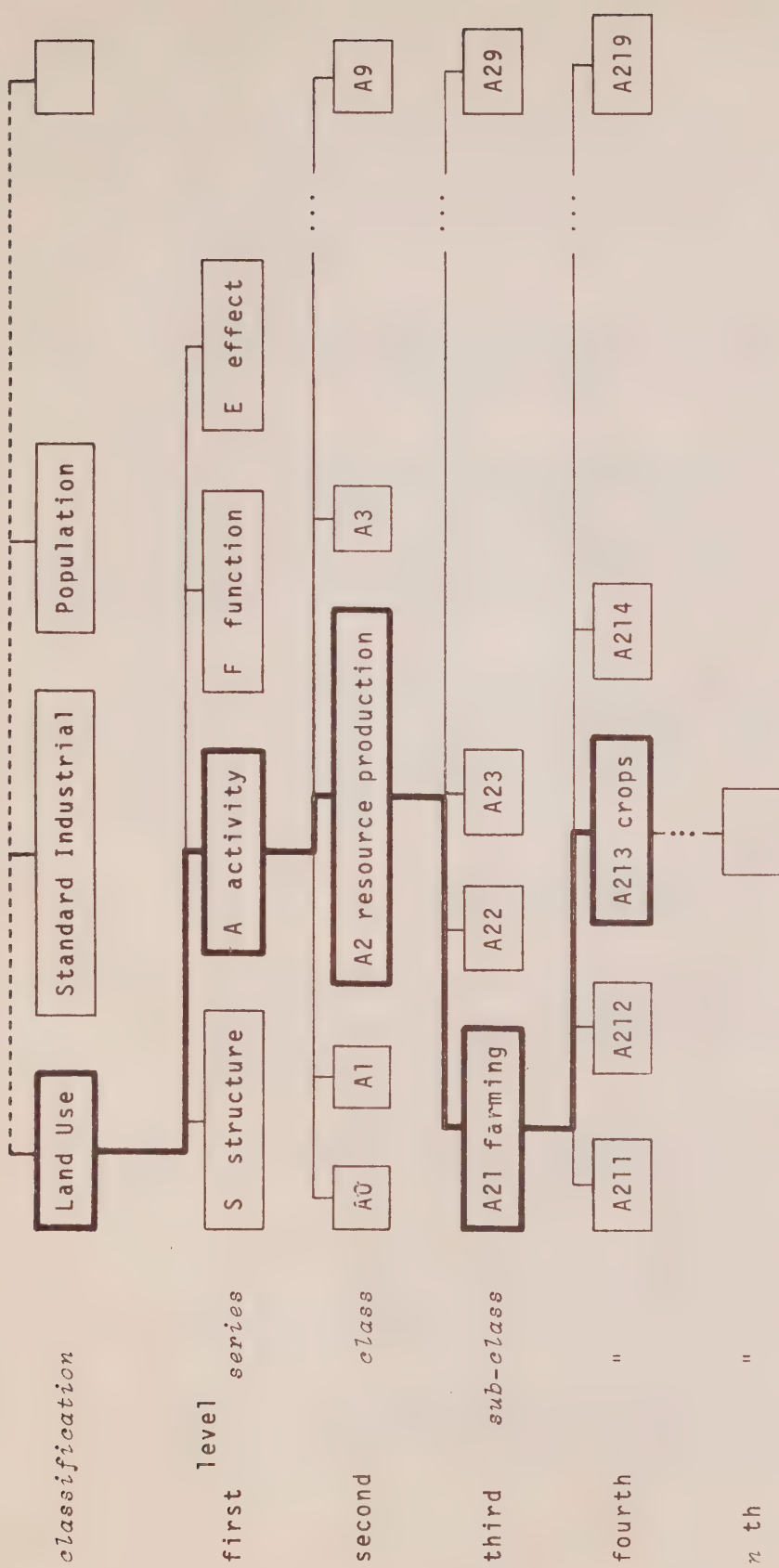


Figure 2: Planning Information System

conditions necessary to satisfy this objective:

1. the classification should cover all significant land uses;
2. it should be able to serve the widest possible number of planners and other potential users.

While no classification may be expected to cover all use eventualities, it should provide for an orderly expansion of categories to inventory unique or localized use phenoma. It should permit detailed categories to be contracted into grosser groups.

The requirements of such a process should take into account its application and relative significance in a wide variety of socio-economic situations. Thus, it was essential to maintain:

- impartiality - the classification should be able to cover urban and rural land uses;
- hierarchy - it should allow for inventory at varying levels of detail and permit an ordered aggregation of data.

Technical requirements for an operational Ontario land use classification were also recognized:

- comprehensiveness - the classification should provide a framework for including each and every possible land use;
- purity - it should develop a single pure criterion for differentiation of sub-classes within each class;

- flexibility - it should permit various combinations of descriptive series to obtain the required analytical classes.

Finally, it was acknowledged that the land use classification should classify information in a manner which would enhance its utility. For example:

- electronic data processing - the classification was designed with the capability of producing large volumes of data, thus, to facilitate the recording, storing, retrieving, and analyzing of data, the adaptability of the system to technology was considered;
- implementation and updating - the classification is open enough to accommodate new data and classes according to implementation and updating requirements.

Outline of the Classification Process

The process used in this study has been developed by applying definitions and criteria to each level of the land use classification. The first level or *series* starts with a universal description of all characteristics of land use. Subsequent definitions and criteria explain the corresponding derived subsets -- at the second level or *class*, third level or *sub-class*, etc. The level is as detailed as the inventory requires.

In designing a classification system, it is necessary to establish the criteria upon which the units being classified are distinguished from one another. This entails setting forth certain characteristics of the units (in this

case, establishments) so that the nature of these characteristics in the different kinds of establishments can be considered. Clearly, the classification system will become confused if more than one set of criteria is used in any particular section of it. In different divisions of the classification, however, different kinds of establishments are encountered and therefore it is necessary to look at slightly different characteristics.*

At the same time, each succeeding classification sub-class is influenced by the hierarchy, or order of importance, of the criteria system. The present classification system points up certain predetermined patterns as required by the objectives of the research. These patterns reveal, for example, an emphasis on planning theory, an awareness of constraints in implementation, and a sensitivity to trends in technology and society.

The methodology allows some degree of "outside influence" but this has been exercised only within the limits of the scope of this research. Thus, the final classification process shows a combination of induction and basic deductive analysis.

Successful classification depends on:

- proper definition of the universe;
- sound application of differentiating criteria;
- complete and systematic extraction of all mutually exclusive classes and sub-classes.

* Dominion Bureau of Statistics. *Standard Industrial Classification Manual*. Ottawa: Dominion Bureau of Statistics, The Queen's Printer, December, 1960.

There is no doubt that "classification by deduction" will provide for a more efficient use of time and achieve a more rigorous system development than the alternative of "classification from below".

Still, the deductive approach entails the risk of creating numerous hypothetical boxes, or of relegating to the residual sub-class "Other ..." many elements that could be significant at a later stage in the application of the process.

Land Data System

Data on land use is just one segment of a comprehensive information system on community physical resources required for planning. To a considerable extent, patterns of land use are determined by the nature of these resources -- their quantity, quality, and location, for example.

Another contributor to the land use pattern is the action of population in adjusting to the land resource. This is a result of available technology and institutions that encourage or retard the development of resources. Land use patterns are increasingly influenced by, say, levels of community awareness (culture) in desiring and maintaining safe and healthy environments.

These observations attempt to place land use and land use analysis in context. Spatial patterns of use are not independent variables. They are the end-result of a complex dynamic process which is part consciously designed and part evolutionary.

In classifying land uses, it might be more realistic to identify the processes occurring on land, or as they are

translated into modifications of the land itself. In other words, a truly comprehensive land data system should try to classify man through his activities on the land. Land use, then, needs constantly to be related to the more encompassing land information system of which it is part.

Constraints

Originally a four-fold series of land use classification had been conceived -- *Structure, Activity, Function, and Effect*. However, the Review Committee concluded that only the two tangible series, structure and activity, should be pursued at this time. Considerable further work is required to make function and effect operational.

In the interest of developing a reliable system, constraints of cost, availability of data, and institutional frameworks for data collection were given little weight in the theoretical portion of the study. These constraints and others are being applied as the system becomes increasingly operational.

While the technique outlined is designed primarily for planners, this does not preclude its use by related disciplines and professions.

CHAPTER 2

STRUCTURE

The structure series describes the buildings, the structures, and the artificial improvements on the land.

The Problem of Definition

The primary concern is with building and structure types and not with the use to which these structures may be put. Obviously, certain activities or operations (say, farming or manufacturing) determine the structure, design, and layout of buildings (in this case, barns and factories).

Similarly, certain architectural forms have been associated with certain activities such as churches, law courts, schools, and hospitals. Yet this is increasingly less true today as more building types are becoming multi-purpose and easily adaptable to specific needs.

This gives rise to problems in grouping structures and activities by type. The designation of the main two-digit classes such as Dwelling Type, Building Type, etc. indicates not the activity pursued in the building or on the structure, but design considerations. In other words, a particular building's structure conforms to the requirements of a particular activity which may or may not be conducted in or on it.

In addition to qualifications of architectural design standards, further indications of building and structural type might be safety, health, sanitation, ventilation, and other standards in construction.

Consequently, structure alone involves a very fluid land use description which is largely dependent on the state of technology, convention, and regulations governing standards.

At increasingly detailed levels of classification the definition and criteria stages become more specific in terms of types within generalized categories. Once the capacity for description broadens to deal with layout and design specifications, it is possible to arrive at an informative classification of land use for buildings and structures.

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>CLASS</u>
<u>S Structure</u>			
A description of varieties of structure types, including buildings, constructions, and improvements located over, on, or under the land as physical alterations.	Structure types are differentiated on the basis of: 1. layout and general design, 2. degree of physical improvements involved, 3. manner of construction.	S0 S1 S2 S3 S4 S5 S7 S8 S9	No Construction or Improvement Improved Area Structure Type Multi-Structural Type Building Type Dwelling Type Converted Structure Under Construction Other

Figure 3: Structure

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
S0 <u>No Construction or Improvement</u>			
No apparent alteration by man of the land.	As definition.	S0	No Construction or Improvement

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>S1 Improved Area</u>			
Artificial changes affecting land that are not primarily constructional.	Improved areas are classified on the basis of whether changes have occurred on or under the surface.	S11	Dredged
		S12	Reclaimed/Drained
		S13	Irrigated
		S14	Landscaped
		S15	Cultivated/Cropped
		S16	Excavated
		S17	Filled
		S18	Mounded
		S19	Surfaced

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>S2 Structure Type</u>	Physical improvements designed to enclose, hold, protect or support materials, and/or goods.		
	The distinction between structure types is based on construction method and purpose:	S21	Enclosure
	1. enclosure of area,	S22	Container
	2. enclosure of space,	S23	Containment
	3. containment of liquids,	S24	Shelter
	4. protective structures,	S25	Support Structure
	5. conveyor and support structures.	S26	Connecting Structure
		S27	Free Standing Structure
		S28	Line, Rail, Road
		S29	Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>S3 Multi-Structural Type</u> The combination of more than one structural type within one major facility.	A composite structure which combines elements or units of several other structure types.	S3	Multi-Structure

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>S4 Building Type</u>			
Structures having a roof and enclosure walls, floors, and foundations which are designed to accommodate goods and/or people for non-residential purposes.	Complete and self-sufficient individual unit for circulation and transportation of persons. Including all Building Types other than Dwelling Types.	S41 S42 S43 S44 S45 S49	Assembly Office/Shop Warehouse/Factory Shelter/Container Combinational Building Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
S5 Dwelling Type			
Similar in definition to Building Type but intended as shelter and living quarters for permanent human occupancy.	Designed as living quarters according to principles of occupancy: safety, light, ventilation, and heating.	S51	Single-Dwelling Unit (detached)
		S52	Two-Dwelling Unit (semi-detached)
		S53	Duplex
		S54	Other Plexes
		S55	Attached Row
		S56	Apartment
		S59	Other (including Hotel, Motel, Lodges, Rooming Houses, etc.)

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>S7 Converted Structure</u>			
Physical changes made to material, layout, and design of buildings and structures to accommodate a change of activity.	Conversions are classified on the basis of the resulting type of adapted space derived.	S71	Converted to Dwelling
		S72	Converted to Assembly
		S73	Converted to Office/Shop
		S74	Converted to Warehouse/Factory
		S75	Converted to Shelter/Container

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>S8 Under Construction</u>			
Construction works in process of erection, undergoing substantial renovation or demolition, including construction abandoned before completion.	Stage and state of construction or physical alteration.	S81	Construction in progress
		S82	Demolition in progress
		S83	Incomplete/Abandoned Structure

CHAPTER 3

ACTIVITY

Activity describes the use to which land is put in terms of ongoing human processes.

Activity as a Land Use

There are two aspects of an activity description of land use. First, activity describes the actual observable-use of land. Thus, land as an index of value or social status would have no activity connotation.

Second, activity is significant only in identifying a man-land relationship. In other words, activity is man in the process of using land by adapting it, by changing its natural form or by causing it to yield a product. Activity also refers to the purposes and results of man's interaction with man -- or with land -- whether such results are the production of a good (manufacturing), a service (education, health service, transportation) or a satisfaction (recreation).

Activity in Theory and Practice

Clawson and Stewart argue that in the activity series we should, in fact, be "classifying man through his activities, not the land as such".* The essential distinction between

* Clawson, Marion, and Stewart, Charles L. *Land Use Information*. Baltimore: The John Hopkins Press (for) Resources for the Future, 1965.

the physical-spatial and man-land concepts of land use has been a key factor in the use of different approaches to urban and regional analysis and planning.*

Planning interest in the concept of activity seems to be related to the expenditure of time among a range of possible place-related actions.** Typically, activity would identify time spent in domestic processes such as sleeping, eating and cleaning, in employment processes such as office-work, manufacturing, and construction, in recreational processes such as hiking and camping and so forth.

These distinctive courses cannot be absolutely defined. An endusive view of activity would lead to inconsistencies, such as cases where to one person an activity may be a

* Chapin, F. Stuart, and Hightower, Henry C. "Household Activity Patterns and Land Use." *Journal of the American Institute of Planners*, Vol. XXXI, No. 3 (August, 1968), 222-231.

Mitchell, Robert B. "The New Frontier in Metropolitan Planning." *Journal of the American Institute of Planners*, Vol. XXVI, No. 3 (August, 1961), 169-175.

Mitchell, Robert, and Rapkin, Chester. *Urban Traffic: A Function of Land Use*. New York: Columbia University Press, 1964.

Rannells, John. *The Core of the City*. New York: Columbia University Press, 1954.

Webber, Melvin M. "The Urban Place and Non-Place Urban Realm." *Explorations Into Urban Structure*. Ed. by M. M. Webber, J. W. Dyckman, D. L. Foley, A. Z. Guttenberg, W. L. C. Wheaton, and C. B. Wurster. Philadelphia: University of Pennsylvania Press, 1964, 79-153.

** Meier, Richard L. *A Communications Theory of Urban Growth*. Cambridge: Massachusetts Institute of Technology Press, 1962.

source of employment and to another it may be a pastime or a domestic exercise.

Examples would include cleaning woman and commercial fisherman and sportsman, taxi driver and regular motorist.

Again, activities do not always occur on specialized land parcels distinguishable by location and supporting facilities. Several land use activities may occur on the same land parcel. For this reason it has sometimes been suggested that separately recognizable activities in fact indicate separate parcels.*

On the other hand, the fact that is developed, say, in single detached housing, is usually of more interest to planners than the individual ownership lots or properties.

In a static sense, activity may be classified as the change that individual parcels undergo to facilitate the production of goods and the provision of services. For instance, the provision of accommodation facilities (shelter) implies the activity of residing.

In fact, the kinds of residential activities that arise are attributable to a wide range of physical, economic, sociological, and technological factors and are reflected in a wide range of considerations -- such as type, size, and density in the design of settlements -- conducive to the provision and maintenance of activities.**

* Chapin and Hightower, op. cit., 116.

** Lynch, Kevin, and Rodwin, Lloyd. "A Theory of Urban Form." *Journal of the American Institute of Planners*, Vol. XXIV, No. 4 (1958), 201-214.

A dynamic view of land use also rests on the idea of activity as describing man's on-going efforts in adapting to the improvement and development of his environment.*

The resulting activity pattern suggests quite different implications for the professional planner in terms of location policy, space economy, periodicity in flows, and for designing settlement patterns to achieve greater efficiency in the use of community resources and a wider level of satisfaction and acceptability.

Predictable patterns of land use may be seen just about anywhere. The purpose of planning is to ensure that such emerging uses conform to the standards of community acceptability.

Planning approval provides for existing activities to continue and for new activities to take place. Thus, planning relies on a certain consistency of motivation, choice, and activity patterns of individuals on the one hand, and desirability, economy and functionalism for society on the other.**

There are several ways to develop a system for analyzing activity. One approach sees living, working, and play space as having parallels in activity.

* Blumenfeld, Hans. *The Modern Metropolis: Its Origins, Growth, Characteristics, and Planning*. Ed. by Paul S. Spreiregen. Montreal: Harvest House, 1967, Chapter 32, "Are Land Use Patterns Predictable", 319-330.

Guttenberg, Albert Z. *New Directions in Land Use Classification*. Chicago: American Society of Planning Officials, 1965, 7.

** Chapin, F. Stuart. "Activity Systems and Urban Structure: A Working Scheme." *Journal of the American Institute of Planners*, Vol. XXIV, No. 1 (January, 1968), 11-18.

Chapin and Hightower suggest grouping activity into "actors" -- firms, governments, and other institutions -- and to this "households" may be added. Godschalk and Mills select individuals, households, firms, and institutions.*

Whichever is adopted -- and here convenience and purpose will be deciding factors -- it is because of actors and actions and their implications for the use of space and planning is put into effect.

"Activity patterns which exhibit a marked degree of stability over time and recurrent configurations in space are of particular interest for land use planning. This is not to say that planning overlooks random patterns or behaviours. Indeed, the difference between a mechanistic and an imaginative approach to planning is in part found in the sensitivity of a plan to opportunities for urban residents to pursue activities in spontaneous and variable patterns.**

* Godschalk, David R., and Mills, William E. "A Collaborative Approach to Planning Through Urban Activities." *Journal of the American Institute of Planners*, Vol. XXXII, No. 2 (March, 1966), 86-95.

** Chapin and Hightower, op. cit., 224.

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>CLASS</u>
A <u>Activity</u>			
Processes and actions perceived by improvements or modifications on the land.	Three phase activity cycle: -- living, -- recreating, -- working. "Working" further classified by availability of goods and services produced: 1. production and extraction of raw materials, 2. conversion and processing of raw materials and resources, 3. physical transportation and distribution of commodities and services, 4. creation and maintenance of public servicing for the above activities.	A0 A1 A2 A3 A4 A5 A6 A7 A8 A9	No Perceived Activity Residential Resource Production Resource Extraction Manufacturing Terminal and Storage Transportation and Communication Shopping, Repair, and Servicing Business and Community Service Recreation

Figure 4: Activity

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A0 No Perceived Activity</u>			
This category is reserved for areas upon which there is no perceivable on-going human occupation of the particular area.	Areas not planned or developed for any of the following uses.	A0	No Perceived Activity

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A1 Residential Activity</u>			
Occurs regularly in a dwelling place or similar environment which usually includes sleeping, storage of personal effects, and may also include food preparation, eating, personal hygiene, and leisure.	Extent of relationship among participants.	A11 A12	Private Residential Collective Residential

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>All Private Residential</u>			
Activity undertaken by persons occupying a dwelling unit, the facilities of which are equally accessible to all occupants.	Frequency and regularity of use.	A111	Principle Private Residential
		A112	Seasonal Private Residential

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
A12 <u>Collective Residential</u>			
Activity shared among groups of individuals within lodging or common lodgings, with or without private sleeping quarters.	Frequency and regularity of use.	A121 A122	Principle Collective Residential Seasonal Collective Residential

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
A2 <u>Resource Production Activity</u>			
Human actions and processes directly involved in the cultivation and harvesting of raw materials.	Management and supervision requirements of cultivation and reaping.	A21 A22 A23 A29	Farming Forestry Fish and Wildlife Production Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A21 Farming</u>			
Crop cultivation and animal husbandry.	1. Farming practices requiring year-round care and supervision of productive trees and vines,	A211 A212 A213 A214 A219	Tree Crops (Orchards) Vine Crops Crops Livestock Other
	2. seasonal field cultivation,		
	3. related to domestic projection of meat, livestock and livestock products.		

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A22 Forestry</u>			
Cultivation and harvesting of trees and tree products.	Forest management, reaping operations, and type of product.	A221	Logging
		A222	Tree Production
		A223	Field Nursery
		A229	Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A23 Fish and Wildlife Production</u>			
Breeding, rearing, management, and cropping of fish and wildlife.	Management and protective requirements for maintaining a variety and quantity of species in a supervised natural habitat.	A231 A232 A233 A234 A235 A239	Fish Hatcheries Fish Runs and Ladders Wildlife Breeding Stations Wildlife Runs and Crossings Wildlife Habitats Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A3 Resource Extraction Activity</u>			
Removal of deposits of non-renewable resources from the land, and the extraction of water supplies.	Specialized extraction techniques.	A31	Shaft Mining
		A32	Pumping
		A33	Open Pit Mining and Quarrying

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A31 Shaft Mining</u>			
Shaft construction, tunnelling, and subterranean extraction of raw material from the earth.	Based on control requirements for safe operations and site desirability for alternative after-use.	A311 A312	Metallic Ore Extraction Non Metallic Ore Extraction

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A32 Pumping</u>			
Extraction of liquids, vapour or gas resources from the earth by suction or pressure or both.	Classification by product type: 1. liquid 2. gas 3. soluble minerals as identified with extraction process.	A321 A322 A323 A324 A329	Water Gaseous Fossil Fuel Liquid Fossil Fuel Soluble Mineral Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
A33 <u>Open Pit Mining and Quarrying</u>			
Removal of ore and the extraction of rock, and derived matter, as a surface mining operation.	Classified generally by process and type of material extracted.	A331	Metallic Ore Extraction
		A332	Fossil Fuel Extraction
		A333	Rock Extraction
		A334	Gravel Extraction
		A335	Sand Extraction
		A339	Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A4 Manufacturing Activity</u>			
Physical conversion of raw materials through processing or combination with other materials so as to improve its usability or preserve its usefulness.	Extent and type of processing or conversion.	A41	Energy Conversion
		A42	Raw Material Processing
		A43	Processed Goods Processing
		A44	Product Assembly
		A45	Waste Treatment

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A41 Energy Conversion</u>			
Harnessing and conversion of energy sources for power purposes.	According to current varieties.	A411	Wind Propelled
		A412	Solar
		A413	Hydro Electric
		A414	Fossil Fuel
		A415	Nuclear
		A419	Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A42 Raw Material Processing</u>			
Transformation of raw materials through manufacturing from their natural state to preserve or improve their quality as independent products or as components of a further process.	Uniqueness of processing.	A421	Water Purification
		A422	Food Processing
		A423	Natural Fibres and Pelt Processing
		A424	Rock and Stone Processing
		A425	Clay Processing
		A426	Ore Processing
		A427	Petroleum Processing and Refining
		A428	Processing of Chemicals
		A429	Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A43 Processed Goods</u>			
<u>Processing</u>			
Manufacturing process	According to process and	A431	Food
converting primary processed	product type.	A432	Textiles
material into a finished		A433	Woodworking and Wood Products
article.		A434	Structural Materials
		A435	Metal and Metal Products
		A436	Petroleum Products
		A437	Chemical Products
		A439	Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A44 Products Assembly</u>			
Mass manufacture of goods and products by joining prefabricated standardized parts.	According to process and product type.	A441	Clothing and Textiles
		A442	Building Components, Furniture, and Fixtures predominantly of Wood
		A443	Containers, Structural Component Furniture, Fixtures, and Fittings predominantly of Metal
		A444	Scientific Equipment and Precision Instruments
		A445	Machinery and Mechanical Equipment including Hardware
		A446	General Equipment, including Household Appliances
		A447	Chemical Products
		A448	Automobiles and Automotive Products
		A449	Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A45 Waste Treatment</u>			
Neutralizing or minimizing effects of harmful waste material before re-entry into natural or production processes.	Physical form and possible control measures in terms of the bio-degradation processes.	A451	Liquid Waste
		A452	Solid Waste
		A453	Gaseous Waste
		A459	Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
A5 <u>Terminal and Storage Activity</u>	The loading and unloading of persons and goods at designated points along an access route; the accommodation of persons prior to embarkation; on-site storage of goods in transit; parking of the conveyance mode.	Based on processes related to: 1. reception of persons and their effects for shipment, 2. boarding or disembarkation of persons and the loading or unloading of goods, 3. designated parking areas for access to modes, 4. central reception and transmission of energy and communication flows, 5. safekeeping of goods between transfers.	Terminal Activity Storage Activity

DEFINITION

A51 Terminal Activity

Activities occurring at nodes along an access route which provide for the unloading of persons and goods, serve as a foci for broadcasting emissions, and the nexuses for distribution of utility lines.

CRITERIA

According to mode and central activities.

CODE

A511

A512

A513

A514

A515

A516

A517

A519

SUB-CLASS

Bus Terminal

Rail Terminal

Dock, Wharf

Airport

Broadcasting and Communication Terminal

Power Transmission and

Control Station

Pipeline Pumping and

Control Station

Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A6 Transportation and Communication Activity</u>			
The actual transfer of persons, goods, and energy through space.	<ol style="list-style-type: none"> 1. Transporting of persons and physical commodities, 2. transmission of electrical pulses along conductor systems. 	A61 A62	Transportation Movement Communication and Energy Conductor System

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
A61 <u>Transportation Movement</u>			
The movement of persons and goods, via demarcated and improved access routes, between locations in space.	According to mode.	A611	Road Traffic
		A612	Railway Traffic
		A613	Air Traffic (along reserved runway approaches)
		A614	Water Traffic (through portages and canals)
		A615	Pipeline Transportation
		A619	Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A62 Communication and Energy Conductor System</u>			
Transmission of electrical power and impulses along wire conductor systems.	According to system.	A621	Power Transmission System
		A622	Telegraph System
		A623	Telephone System
		A629	Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
A7 Shopping, Repair, and Servicing Activity			
Commercial services provided to the individual customer, be they a consumer or firm.	Differentiated by type of service:	A71	Retail Shopping
	1. shopping,	A72	Repairing and Servicing of Consumer Commodities
	2. repair of personal and household equipment,	A73	Personal Services Retailing
	3. services to consumers,	A74	Business Plant and Equipment
	4. services to commodities in general.		Sales Servicing

DEFINITIONCRITERIASUB-CLASSCODEA71 Retail Shopping Activity

Retailing of individual

goods either as a specialized operation or as sections within a varied commodity sales operation.

Identification of commodity

type and typical size parcel required for:

1. general retailing

operation,

2. specialty item retailing,

3. special area activity

within a general

operation,

4. combined specialty item

and service retailing

together with general

retailing within an

integrated locale.

Food Retailing

Clothing Retailing

Furniture, Hardware, and

Appliances Retailing

Automotive Products, Sales,
and Showrooms

Variety Store Retailing

Department Store Retailing

Specialty Store Retailing

Shopping Centre

Other

A711

A712

A713

A714

A715

A716

A717

A718

A719

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
A72 <u>Repairing and Servicing of Consumer Commodities</u>			
Services provided on particular parcels for maintenance and repair of personal commodities.	By major identifiable types.	A721	Clothing and Textiles
		A722	Furniture, Hardware, and Household Appliances
		A723	Automobile Service and Repair
		A729	Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
A73 Personal Services <u>Retailing</u>			
Dispensing of services by direct transaction to a paying clientele on a private or an individual customer basis.	By traditional service groupings: 1. individual (and household) financial transactions, 2. professional services to individuals and households, 3. services (not otherwise included) to customers' person, 4. services privately performed for individual enjoyment.	A731 A732 A733 A734 A739	Financial Service Professional Service Refreshment and Entertainment Cosmetic Service Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A74 Business Plant and Equipment Sales Servicing</u>			
Services provided to business plant and equipment as distinguished from service to household and the maintenance of community equipment.	Activities involving the sale of business plant and equipment; those which predominantly maintain and repair the same.	A741 A742 A749	Sales and Servicing Equipment General Maintenance Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
A8 <u>Business and Community Service</u>			
Activities of an advisory, consultative or support nature provided to business and government decision-makers; the repair and servicing of non-personal equipment; the provision of maintenance of community services.	1. Production of community services, 2. general soft, non-personal support services.	A81 A82	Services to Business and Government Management Community Service Production

DEFINITION

A81 Service to Business and Government Management

Catering primarily to the needs of business establishments and government in the provision of general support services, usually media-oriented with transactions occurring by correspondence, telephone, telex, etc.

CRITERIA

Enumeration of distinguishable types of support soft services in management of production and marketing; management of general community administration.

CODE

A811
A812
A813
A814
A815
A816
A819

SUB-CLASS

Research and Development
Promotion and Advertising
Financial Service
Personnel Service
Information and Data Processing
Professional Services
Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A82 Community Service Production</u>	Provided by and available to the community-at-large being of such a nature that recipients need not pay for service directly or be individually identified.	A821 A822 A823 A824 A825 A826 A827 A829	Administrative Service Legislative and Judicial Service Protective and Custodial Service Educational Service Health and Sanitation Service Welfare, Philanthropic, and Charitable Service Religious Service Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A9 Recreational Activity</u>			
Planned individual and group activity conducted for enjoyment outside of the home, not associated with work, shopping, etc. and requiring specialized resource, locational, design or aesthetic characteristics.	1. Recreational activities limited to the quality of a natural resource unit, 2. recreation derived from actual travel experiences, 3. recreation activities based on man-made development or modification of a natural resource.	A91 A92 A93 A94 A95 A96	Natural Environment Recreation Natural Environment Travel Outdoor Recreational Activity Outdoor Sporting Activity Indoor Recreational Activity Indoor Sporting Activity

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A91 Natural Environment Recreational Activity</u>			
Recreational activities conducted on unimproved locations or within a natural resource unit which do not deplete the quality of the resource.	According to manner of exploitation or enjoyment of resource type.	A911 A912 A913 A914 A915 A919	Swimming and Bathing Camping and Picnicking Boating Hunting, Fishing Appreciating Nature Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A92 Natural Environment</u> <u>Travel Activity</u>			
Trail routes designated to be of scenic or historical interest and which of themselves constitute recreational experiences.	According to travel mode.	A921 A922 A923 A929	Recreational Walking and Hiking Cycling, Horseback Riding, Snowmobiling Cross Country Skiing Other

DEFINITION

A93 Outdoor Recreational Activity

Enjoyment of participatory or spectator events outdoors that are essentially non-exertive and designed to impress, enrich, or inform.

CRITERIA

Classified in relation to:
1. natural phenomena,
2. improved site phenomena,
3. essentially social,
4. combination of the above.

CODE

A931
A932
A933
A934
A935
A936
A937
A938
A939

SUB-CLASS

Viewing of Natural and
Historical Site
Botanical Garden
Zoological Garden
Aquatic Garden
Drive-in Cinema
Fairground, Amusement Park
Park, Walk
Camping
Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
<u>A94 Outdoor Sporting Activity</u>			
Outdoor sports and games on limited sites which may or may not be improved; seating and facilities for players and spectators may be provided.	According to activity type.	A941	Field Game Activity
		A942	Range
		A943	Court
		A944	Golf
		A945	Open Water Activity
		A946	Open Area Winter Sport
		A949	Other

DEFINITION

A95 Indoor Recreational Activity

Indoor activities of an individual, non-competitive nature designed to enrich participants, spectators or audience.

CRITERIA

Classified by:

1. audience assembly type,
2. indoor touring and viewing type,
3. individual self-amusement by reading, record-listening, slide-viewing, etc.,
4. physical relaxation and enjoyment.

CODE

A951

A952

A953

A954

A955

A956

A959

SUB-CLASS

Theatre, Concert Hall, Cinema, etc.

Art Gallery, Museum

Exhibition Hall

Planetarium

Library

Exercise Facility

Other

<u>DEFINITION</u>	<u>CRITERIA</u>	<u>CODE</u>	<u>SUB-CLASS</u>
A96 <u>Indoor Sporting Activity</u>			
Indoor activities undertaken for enjoyment which involve some competition between individuals and groups.	According to identifiable activity types.	A961	Gymnasium, Arena
		A962	Bowling Alley, Curling Rink
		A963	Billiards, Pool Hall
		A964	Swimming Pool
		A969	Other

CHAPTER 4

APPLYING THE CLASSIFICATION

The Ontario land use classification developed here comprises two separate yet parallel descriptive series. Each is open and capable of further local expansion.

All of the existing classifications which were examined during the study revealed some deficiencies in terms of their acceptability to planners for data collection, consistency, and/or analysis. Still, these methods have desirable qualities as well as shortcomings and deserve study as to the principles and practices underlying a truly systematic view of land use.

Although mapping and geocoding have made considerable advances in display techniques by electronic data processing, maps in many cases will continue to be prepared manually. This classification lends itself to varying levels of map documentation with two, three, and four level codes for municipal mapping and plans.

Colour codes can be successfully applied at the class (second) level. Such codes, supplemented by symbols and alphabetic codes, could be attempted at the sub-class (third) level while the detailed sub-class (fourth) level -- usually the basic inventory level -- would be expected to serve as a numerically-coded map display system.

Since the land use classification is capable of producing large quantities of data, the organization of

this information suggests the development and incorporation of a geocoding system, but this was not within the scope of the study.

Parallel Information System

Throughout the course of evolving the present classification, there was continual reference to other information related to land use. Assessment records, for example, can have detailed inventories of information on such matters as floor area and number of stories; this could complement the structure series. Likewise, the parallel information available in the Standard Industrial Classification could be beneficial to the activity series.

It should be emphasized that the land use classification proposed here deals exclusively, at this point, with two series, structure and activity, and cannot be regarded as a comprehensive planning information system.

Nonetheless, planning relies heavily on land use -- its descriptions, enumeration, and analysis. The classification described in this report offers a standardized organization and process for classifying land according to criteria of structure and activity and, as such, can be a valuable tool for the planner.

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- MITCHELL, Robert B. "The New Frontier in Metropolitan Planning." *Journal of the American Institute of Planners*, Vol. XXVI, No. 3 (August, 1961), 169-175.
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APPENDIX A

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APPENDIX B

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APPENDIX C

ANNOTATED BIBLIOGRAPHY

The following is a selected annotated bibliography of the more significant literature reviewed in the development of the Land Use Classification.

ALBERTA, DEPARTMENT OF MUNICIPAL AFFAIRS. *An Urban Land Use Analysis of Selected Alberta Communities*. Edmonton: Provincial Planning Branch, Department of Municipal Affairs, Spring, 1971.

This publication outlines the results of a survey of land use patterns in eighty selected Alberta urban communities, including tabulation and analysis of such uses. The comparison of land use data among the several municipalities was intended to provide some indication of minimum land requirements for different urban community types by land use classes. Nine major classes and seven municipality types are distinguished. The study illustrates the limitations to definitive results arising from classification imperfections, grossness of data, mechanics of data collection and comparison. However, the possibilities for this type of research application is enticing.

ANDERSON, James R. "Towards More Effective Methods of Obtaining Land Use Data in Geographic Research". *The Professional Geographer*, Vol. XIII, No. 6 (November, 1961), 15-18.

The paper is a discussion of methods for improving reliability of land use data. Methods relate to the precision in definition and techniques of data collection.

BAIR, Fred H. Jr. "Mapping Program for Planning: Tied to Aerial Photographs." *Florida Planning and Development*, Vol. 11, No. 5 (May, 1961), 1-5; Vol. 11, No. 6 (June, 1961), 1-5, 10; Vol. 11, No. 7 (July, 1961), 1-5.

Methods of improving land use information are related to problems of identification, collection, and map representation.

BARTHOLOMEW, Harland. *Land Uses in American Cities*.
Cambridge: Harvard University Press, 1955.

An early theoretical contribution to approaches and practical applications involved in land use classification. It is deficient in several respects, yet is a useful point of departure.

BLUMENFELD, Hans. "The Conceptual Framework of Land Use." *The Modern Metropolis: Its Origins, Growth, Characteristics, and Planning*. Ed. by Paul S. Spreiregen. Montreal: Harvest House, 1967, 297-301.

A discussion of contributions to the subject of land use classification is presented. Included is a review of deficiencies in the approaches with some useful directions for future research.

BOYCE, Ronald R., and BROWN, Robert L. "Some Land-Use Research Needs in Metropolitan Areas." *Urban Land*, Vol. 22, No. 4 (April, 1963), 1-5.

A critique is undertaken of current land use classification systems. Shortcomings requiring attention include (1) more specific and in-depth information, (2) functional aspects of land use, (3) impact, aesthetic, and economic considerations of land use.

BURLEY, Terence M. "Land Use or Land Utilization." *The Professional Geographer*, Vol. XIII, No. 6 (November, 1961), 18-20.

The author briefly attempts to reconcile the concepts of land use and land utilization. Land use is conceived of as a combination of land cover and land utilization.

BURNETT, F. T. "Open Space in New Towns." *Journal of the Town Planning Institute*, Vol. 55, No. 6 (June, 1969), 256-262.

The article considers the special difficulties of classification of open space. Involved is a survey of methodologies which are evaluated for comparison in ten British towns. General problems and weaknesses of the various systems are revealed.

CAMPBELL, Robert D., and LEBLANC, Hugh. *An Information System for Urban Planning*. Washington: Urban Planning Bulletin No. 1, Urban Renewal Administration, Housing and Home Finance Agency, 1965.

The study argues the case for a co-ordinated framework of data collection in planning. The quantity and quality of land use information should relate to the proposed application and acceptable weighting so that it can be useful and relevant.

CANADA, DEPARTMENT OF MINES AND TECHNICAL SURVEYS. *Land Use Classification: A Guide for Field Officers*. Ottawa: Geographical Branch, Department of Mines and Technical Surveys, March, 1962.

An instruction manual for inventorying land uses, the guide combines the principles of classification with the principles of enumeration. Sometimes suggesting alphabetic labelling, the resulting categories vary widely in quality. Further problems of mixed categories, inconsistent allocations, ill-defined categories are evident.

CANADIAN ASSOCIATION OF GEOGRAPHERS, COMMITTEE ON LAND USE. "Essays on Land Use." Papers presented at the Annual Meeting of the Canadian Association of Geographers, McMaster University, Hamilton, 1962. (Mimeographed.)

A collection of introductory papers seeking to explore the various aspects of land use inventorying and the organization of data for map representation. The contributions lack depth and ignore the implications for analysis and policy formulation.

CANADIAN GOOD ROADS ASSOCIATION. *Roads and Street Classification*. Ottawa: Technical Publication No. 3, Canadian Good Roads Association, 1959.

A simplistic, but useful functional classification of roads and streets in terms of transportation capabilities.

CHAPIN, F. Stuart Jr. *Urban Land Use Planning*. 2nd ed. Urbana: University of Illinois Press, 1965, especially Chapters 3, 4, 8, 12, 13.

An incisive discussion of various aspects of the land use classification problem. These sections combine an analysis of urban land use structure and trends, theoretical and practical aspect of land use data documentation and research, and discussion of the problem of classification itself. Although the suggestions for an acceptable system are themselves questionable, this work is a balanced and useful contribution.

CHICAGO AREA TRANSPORTATION STUDY. Chicago: Chicago Area Transportation Study.

"Land Use Categories," by John R. Hamburg and Robert H. Sharkey, 1957.

"Central Business District Land Use Survey Manual," by Robert H. Sharkey, 1957.

"Suburban Land Use Survey Manual." by Robert H. Sharkey, 1958.

"Land Use Updating Survey," by Samuel M. Hadfield, 1966.

These comprise some of the background papers on methodology adopted in the land use study phase of the Chicago Area Transportation Study. Land use classification schemes for inventorying the necessary data for transportation analysis in the urban core and on the fringe are developed. These papers also include comments on the design of land use surveys, source materials for use in land use surveys, restructuring of historical data for compatibility, and the mechanics of classification. These are useful references.

CLAWSON, Marion, and STEWART, Charles L. *Land Use Information: A Critical Survey of U.S. Statistics Including Possibilities for Greater Uniformity*. Baltimore: The John Hopkins Press (for) Resources for the Future, 1965.

This survey by Clawson and Stewart is perhaps the most informative contribution to the subject of land use classification. From an appraisal of needs, the study proceeds to evaluate existing systems and to devise a suggested classification and code. Practical problems of data inventory are discussed.

COLEMAN, Alice, and MAGGS, K. R. A. *Land Use Survey Handbook: An Explanation of the Second Land Utilization Survey of Britain on the Scale of 1:25,000*. 5th ed. London: Department of Geography, King's College, University of London, 1968.

This is a condensed explanation of the techniques adopted in the above survey. It is more useful as an approach to map representation of geographical (land use) data. It exposes some problems which are encountered in mapping land use data for planning purposes.

COLLINS, W. Gordon and BUSH, Peter W. "The Definition and Classification of Derelict Land." *Journal of the Town Planning Institute*, Vol. 55, No. 3 (March, 1969), 111-115.

The environmental problems created by land no longer in active use present a considerable challenge to the description and classification of land uses. This article presents one solution to accommodating this problem within a land use classification.

CONKLIN, Howard E. "Principles of Land Classification." *Modern Land Policy*. Chapter 25. Urbana: Papers of the Land Economics Institutes, University of Illinois Press, 1960.

The article discusses the principles of classification, approaches to classification systems, and the application of the theory of classification to land. Concepts of basic unit size, richness of detail, accuracy of mapping representation are presented as relevant to the problem. These observations developed for land data definition, organization and retrieval are applicable to land use.

COOK, Robert N. "Land Law Reform: A Modern Computerized System of Land Records." *University of Cincinnati Law Review*, Vol. 38, No. 3 (Summer, 1968), 385-448.

The article outlines the possibilities of an integrated land data system. It would pull together information on the parcel from a wide variety of sources and professions. The fact developments are already moving in this direction requires that the several sources develop pure and compatible systems.

COVENTRY, City of. *The Point Data System*. Coventry: Office of the Chief Architect and Planner, March, 1971.

A report on a pilot project undertaken to develop a comprehensive system for describing, collecting, storing, and retrieving data on land. Operationally, it requires provisions for updating and for data access. In design, it is attentive to possible user requirements for description and analysis. It provides for maximum flexibility in data retrieval. Data is hierarchically structured. There is provision for cross-referencing between activities functionally linked.

DE CHIARA, Joseph, and KOPPELMAN, Lee. *Planning Design Criteria*. New York, Toronto: D. Van Nostrand Reinhold, 1969.

This handbook offers a useful reference source for planning and design standards. The manual draws on a wide range of previously published work and experiences in order to achieve a generally acceptable set of standards. The land use classification section is basically a reproduction of the URA-BPR *Standard Land Use Coding Manual*. Other sections of the text discuss the definitions, varieties, and classification of specialized land uses. Offered in a concise form are illustrations of some of the general and regional land use concepts adopted in the United States. A useful first reference work.

DENVER, INTER-COUNTY REGIONAL PLANNING COMMISSION. *Land Use Classification Manual*. 2nd ed. Denver: Master Plan Report No. 26, Inter-County Regional Planning Commission, July, 1966.

A four-digit "activity" classification adaptable for regional and municipal planning. It was developed for area transportation studies, and relies considerably on the Standard Industrial Classification. The main dimension of "activity" is riddled with impurities, and there are noticeable weaknesses in treatment of some classes.

DETROIT METROPOLITAN AREA REGIONAL PLANNING COMMISSION. LAND CLASSIFICATION ADVISORY COMMITTEE. *Land Use Classification Manual*. Chicago: Public Administration Service, 1962.

The manual proposed to develop a classification which would be sufficiently informative so as to indicate "the place of land use in the economy of the city and region, the importance of the use as a community function, and to some degree its planning potential and future."

GUELPH, DEPARTMENT OF PLANNING AND DEVELOPMENT. "Land Use Inventory for the City of Guelph: Explanation of Procedures." Guelph: Department of Planning and Development, May, 1971. (Mimeographed.)

An information booklet includes instructions and explanations on the process of data inventory for a city land use analysis. The classes combine various descriptive features of land use including structural, as applied to residential and automotive, economic description, based on

the 'establishment' for commercial uses, and various combinations of these and other criteria for the remaining industrial, institutional, and open space. The various classes are clearly described in the section "Land Use Definitions". With the limitations of extensive data manipulation aside, the resulting data might well serve its primary purpose of a statistical inventory for planning within the city.

GUTTENBERG, Albert Z. "A Multiple Land Use Classification System." *Journal of the American Institute of Planners*, Vol. XXV, No. 3 (August, 1959), 143-150.

A land use classification system comprising six uni-dimensional land use data streams is proposed. This facilitates data manipulation within and between streams. Data will be collected on the basis of the parcel.

GUTTENBERG, Albert Z. "New, Old Criteria Explored: in search of means of evaluating non-residential property." *Journal of Housing*, No. 2 (1964), 73-79.

The author attempts to rationalize approaches to inventory of community physical stock. The proposed methodology suggests a framework equally applicable to all physical stock based on their functional efficiency. This is expressed through criteria of technological updateness, economic durability, and social impact.

GUTTENBERG, Albert Z. *New Directions in Land Use Classification*. Chicago: American Society of Planning Officials, 1965.

A comprehensive conceptualization of the scope of "land use". The article suggests that a classification system should encompass the referential (descriptive), appraisive (evaluational), and prescriptive modes. Criteria for developing such a system are not clearly proposed, although it is recognized that subjectivity of indices may be a major deterrent.

GUTTENBERG, Albert Z. *The Social Evaluation of Non-Residential Land Use: Substandardness Criteria*. Urbana: University of Illinois, 1967.

A continuation of the discussion of the criteria for land use classification, namely building quality or updateness, economic durability, and social impact. "Substandardness" is assessed in terms of the degree of compliance "with the

numerous codes, statutes, regulations, ordinances, regardless of whether or not the enactments are sound ones." Field survey forms are suggested for on-spot inventory, together with schedules for office documentation.

HACKETT, Brian. "The Landscape Analysis of New Town Sites." *Journal of the Town Planning Institute*, Vol. XLVIII, No. 2 (February, 1962), 38-40.

A classification system is developed. It exposes landscape assets and reveals problems and possibilities of site development which may serve as indicators of future uses and the appropriateness of land uses. This is a discussion of the physical bases for land use potential, especially in urban areas.

HILLS, G. A., Chairman. "A Multiple Land Use Plan for the Glackmeyer Development Area." *Report of the Glackmeyer Subcommittee of the Northern Region Land-Use Planning Committee*. Toronto: Ontario Department of Lands and Forests, 1960.

A rural perspective of land use classification problems is given which leads to the development and application of a model. Involved is a classification of physiographic basis for activities, improvements, and potential. The "feature complex approach" appears suited to rural areas; "the single characteristic approach" is better suited to urban land use description.

ISARD, Walter. "A Classification System for Outdoor Recreational Activities." *Ecologic - Economics Analysis for Regional Development*. Part 5.4. New York: The Free Press, 1972.

A very relevant, although specialized, treatment is provided in this classification of outdoor recreation activities. The system attempts "to facilitate data collection" by providing information meaningful for development policy analysis. It is also useful for operational models. The system is patterned after the Standard Industrial Classification, but it is recognized that some outdoor recreational facilities cannot fit into the industrial grouping. The system envisaged provides for some 900 class possibilities.

KLINGEBIEL, A. A. "Land Classification for Use in Planning." *The Yearbook of Agriculture*, 1963. Washington: United States Department of Agriculture, G.P.O., 1963, 399-407.

A discussion is made of the physical bases for classifying land uses in planning of agriculture. Soils, location, and land capability, the development potential indices, are considered together with cost, access, and effect.

LACATE, Douglas S. "A Review of Landtype Classification and Mapping." *Land Economics*, Vol. XXXVII, No. 3 (August, 1961), 271-278.

Discussed is a method of land type classification based on the physical properties of the land. Land use, as the result of human occupancy upon land types, requires an understanding of the relationship between both information sets. This may be so complex as to discourage detailed investigation for small areas.

MCCABE, Robert W., and SAMERY, Eva. "Planning Board Data System." Paper presented at the Planning Staff Conference 1966, Community Planning Branch, Department of Municipal Affairs, Toronto, 1966. (Mimeographed.)

The paper is an overview of the experiences of the City of Toronto Planning Board in developing a planning data system. It provides an outline of data input at each stage of development and an evaluation of its efficacy in meeting planning information needs. The land use information section of the municipal unified information system is assessed as to its volume, variety of information, and adaptability for expansion. The case for uniform data collection, standard definitions, and common locational identifiers, are prerequisites to an operational, standard land use classification.

MCDOWELL, Bruce D., and MINDLIN, Albert. "Obtaining Metropolitan Planning Data from Local Governments." *Journal of the American Institute of Planners*, Vol. XXXVII, No. 2 (March, 1971), 111-115.

This article is a review of the design and workings of the land data information program of the Metropolitan Washington Council of Governments. The features of the system involve the creation of a common referenced, area recording system while at the same time allowing member files to remain unchanged. Data to maintain the system is supplied from a wide variety of sources throughout the area. This solution to land use data compatibility is restricted by size of area. Expansion to include more diverse systems strains the ability of the common systems to preserve links.

McGIMSEY, George B., and DEANEHAN, Alan F. *Land Use Accounting - Codes and Concepts*. Baltimore: Research and Analysis Section, Baltimore, City Department of Planning, September, 1964.

This publication offers a framework for integration of information sources with an easily accessible machine accounting system. Data is compiled for the parcel on the activity of the establishment, structures, and ownership. The system relies heavily on the Standard Industrial Classification series. Information gaps suggest recourse to sample survey.

MURPHY, Raymond E. *The American City*. New York: McGraw-Hill, 1966.

Various sections of this text contain discussions on land use data needs for describing and planning the urban environment. The author accepts the Standard Industrial Classification as capable of revealing sufficient data information on land use. He recommends that modifications be made as required. The text reviews several problems in various approaches to land use classification and also discusses the preparation of land use maps.

NICHOLSON, N. L., CORNWALL, I. H. O., and RAYMOND, C. W. *Canadian Land Use Mapping*. Ottawa: Geographical Paper No. 31, Geographical Branch, Department of Mines and Technical Surveys, 1961.

An example is presented of land use classification at the grosser level of detail. The correlation of levels of information and the various mapping scales provide a basis for the evaluation of deficiencies and needs.

NIEDERCORN, John H., and HEARLE, Edward F. R. "Recent Land Use Trends in Forty-Eight Large American Cities." *Land Economics*, Vol. XL, No. 1 (February, 1964), 105-110.

A comparative study is presented of land use trends in forty-eight American cities. The study adopts a six major category classification system. Although convenient as an acceptable common denominator, this system does not offer significant improvement on previous models.

NORTHEASTERN ILLINOIS METROPOLITAN AREA PLANNING COMMISSION. *Land Use Handbook: A Guide to Undertaking Land Use Surveys*. Chicago: Northeastern Illinois Metropolitan Area Planning Commission, 1961.

The publication is a manual on land use inventory methods. The land use classification system combines codes applicable at community, county, and metropolitan levels. Lack of clarity in criteria results in hybrids in some instances and inconsistency in others. The classification is supplemented by survey, field mapping, and colour code illustrations.

ONTARIO, DEPARTMENT OF EDUCATION. *Standards and Definitions of Terms Used in the Planning of Public Parks, Public Recreational Areas, Public Recreational Structures.* Toronto: Community Programs Division, Department of Education. (Undated.)

The introduction to this manual described its contents as "standards, definitions, descriptions, and planning principles (which) have been developed, checked, adapted, and used by professional planners, recreationists, and park superintendents in the municipalities of Burlington, Kitchener, Oakville, and Toronto Township". Except for an abbreviated classification of park areas developed primarily with regard to their service areas, no consistent attempt at classification in terms of either the kinds of activity on them or their design specifications was made. The manual presents suggested standards for various type facilities (number and size to population ratio). An extensive "glossary of public recreation terms" is also included.

ONTARIO, DEPARTMENT OF MUNICIPAL AFFAIRS. *Land Use Legends and Reproduction Methods for Official Plans and Zoning By-Law Maps.* Toronto: Community Planning Branch, Department of Municipal Affairs, 1961.

A presentation of a standardized land use legend is given including mapping symbols. Accent is on representation of land use data, i.e., drafting and reproduction techniques, and materials. Problems of, and approaches to, classification of land use types are not specifically emphasized. Intended applications are specific to Official Plans and Zoning By-laws. Land use classes used in common practice for both types of planning documents are listed with recommended zip-a-tone codes.

ONTARIO, DEPARTMENT OF MUNICIPAL AFFAIRS. *Urban Land Use in Ontario.* Toronto: Research and Special Studies Section, Community Planning Branch, Department of Municipal Affairs. (Undated.)

This publication, using simple regression analysis, attempts to identify significant variations in land use

allocations as a function of population, for fifty-two major Ontario centres. The report indicates one possible useful application of a more precise land use classification system and a more sophisticated data inventory system.

ROTOFF, Basil M. *Planning and Land Use Data Bank: A Pilot Project*. Winnipeg: Department of City Planning, University of Manitoba, July, 1970.

An especially useful Canadian contribution, the author discusses components of a land use section of a planning information system, methods of data collection, organization, storage, and retrieval to facilitate users. The data source is the Municipal Assessment Roll suitably re-structured for maximum efficiency. The information system includes data on ownership, property, building, location, supplemented by a two-digit Standard Industrial Classification code. In anticipation of a standard land use classification system the Standard Industrial Classification code has not been refined. The system is referenced to presently operational Manitoba Government systems by use of a conversion code.

SAN DIEGO COUNTY COMPREHENSIVE PLANNING ORGANIZATION.
San Diego Region: Land Inventory Program Manual of Procedures. San Diego: San Diego County Comprehensive Planning Organization, July, 1968.

A four-manual series, including an operational classification code, has been used for land inventory in San Diego County. The manuals suggest a step-by-step procedure for data enumeration, assembly, documentation, and representation. The system is based on the URA-BPR modifications for local uniqueness. This is basically an "activity" oriented system with partial auxilliary codes on "function" and "structure". A useful feature of this experience is the consideration given to devising a system acceptable to the several municipalities in the county.

SANTA CLARA COUNTY PLANNING DEPARTMENT. *Land Use Issues in Santa Clara County*. San Jose: Santa Clara County Planning Department, 1963.

A discussion of conditions and trends in land use for Santa Clara County and the implications of these trends for planning. It indicates the nature and types of land use information required for future planning. This is organized into a model classification system based on "the parcel". Generally, this is a balanced discussion, though the system reveals weaknesses of method and content.

SHAPIRO, Irving D. "Urban Land Use Classification." *Land Economics*, Vol. XXXV, No. 2 (May, 1959), 149-155.

The author argues that, in classification, primary focus must be on the purpose of the system. He evaluates some current systems and proposes features for an improved system. This proposal is entirely based on an "activity" description of use.

SHERMAN, John C. and TOBLER, Waldo R. "Multiple Use Concept in Cartography." *The Professional Geographer*, Vol. IX, No. 5 (September, 1957), 5-7.

This article discusses ways and means of relating considerations of scale and physical size to requirements of legibility and information detail in the course of mapping. Problems in depiction of multiple use are also discussed.

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION. "Land Use Classification System." *Regional Land Use - Transportation Study*. Waukesha: Land Use Survey No. 5, Southeastern Wisconsin Regional Planning Commission, May, 1963.

Another instance of an operational land use system designed primarily for use in transportation planning. This bias is evident in structure and definition of classes. Functional aspects of use were not developed. The use of air photographs as source material, presumably supplemented by field surveys, necessitates inventory at generalized levels.

SPARKS, Robert M. "The Case for a Uniform Land Use Classification." *Journal of the American Institute of Planners*, Vol. XXIV, No. 3 (1958), 174-178.

This is a well-presented discussion of the need for a standard land use classification system and possibilities for its solution. The author suggests modification of the Standard Industrial Classification as one possibility, but on condition attention is paid to the possible pitfalls raised by different purposes. These also include highlighting problem areas in dealing with *spatial* use inventory.

TEITZ, Michael B. "Land Use Data Collection System: Some Problems of Unification." *Papers and Proceedings of the Regional Science Association*, Vol. 17, (1966), 179-194.

This article introduces a conceptual tool for designing a land data information system achieving the best combination of data quality and quantity. Some problem areas in inventory have been identified. It is suggested that optimum data coverage is obtained when no further adjustments between detail and size of enumeration unit will improve quality without increasing costs per unit of information. The study assumes existence of an acceptable land use classification system and perfect substitutability between informational richness and inventory unit.

TORONTO, CITY PLANNING BOARD. *Data Bank Manual*. Toronto: City Planning Board, May, 1971.

This is a guide to the organization and listing of planning data held by the City Planning Board. Information is compiled on the property, initially from assessment records and field surveys (a re-survey of commercial and new residential property was undertaken in 1966). The land use codes are applicable either to the 'dominant' use of the property or to secondary uses within the property. The codes themselves are a continuous listing of some 99 categories. Each category is uniquely defined in terms of a descriptive mix which includes size, physical characteristics, activity, structure, function, ownership, and tenure among others.

TORONTO, METROPOLITAN PLANNING BOARD. *Data Bank Manual - Metropolitan Toronto*. Toronto: Research Division, Metropolitan Toronto Planning Board, July, 1970.

This manual offers a land use related information series. Its design appears to have been governed by the need to input such land data as was produced by the Assessment Data Revision sheet and such economic data as results from the Standard Industrial Classification. The system combines data on building description, economic activity, physical land use, property, tenure, assessment coding property class, and zoning under a single umbrella. Some of these series have themselves not been fully developed. The entire land use section is replete with groupings of generically dissimilar classes, e.g., the Standard Industrial Classification orientation is unsuited to a land use treatment of activity. "Physical" codes appear to borrow from activity codes.

TOURISM AND OUTDOOR RECREATION PLANNING STUDY. "Interviewer's Instruction Manual: List of Working Definitions." *Survey Documents: Ontario Recreation Survey, Part 3, Appendix*. Toronto: Tourism and Outdoor Recreation Planning Study Committee, June, 1973.

These guidesheets present in clear and concise form definitions, descriptions, and rules for inventory of common recreational activities. Activities are classified in a generalized manner as recreational 'per se', cultural, or leisure pursuits; a further listing and description of recreation and travel shelters (means of accommodation), is also included.

TOWN PLANNING INSTITUTE OF CANADA, LAND USE STUDY ADVISORY COMMITTEE. "Land Use Classification and Coding in Canada: An Appraisal." Ed. by Gerald Hodge and Robert W. McCabe. *Plan Canada*. (June, 1968).

This is a comprehensive assessment of the scope and nature of the problems surrounding land use classification systems in general. With implications for Canadian applications, the appraisal sketches the framework for an ideal type system and discusses related problems in modification for actual use. Problems of hybrid classes, inventory, and integration with other data series, have received explicit comment. This is an essential introductory source.

TRI-STATE TRANSPORTATION COMMISSION. *Manual for the Tri-State Land Area and Floor Space Inventory*. New York: Tri-State Transportation Commission, May, 1968.

The manual presents a discussion of aspects of land use inventorying as part of a wider program of land data recording. The inventory primarily uses secondary information sources, e.g., the Ordinary Real Estate File, and Sanborn Fire Insurance Map. This was supplemented by aerial photographs, base maps, and work maps demarcating land use parcels, i.e., homogeneous activity areas. Features of the system include the construction of a gross land use system which combines elements of activity and structure. There is a further adaptation to handle complex land use situations, as for example, the New York City core.

UNITED STATES, DEPARTMENT OF THE INTERIOR. *Where Not to Build: A Guide for Open Space Planning*. Washington: Technical Bulletin No. 1, Bureau of Land Management, Department of the Interior, G.P.O., April, 1968.

This bulletin is a specialized contribution to land use classification confined to open space uses. It discusses the variety of concepts and factors impinging on open space definition and use. It attempts to organize the variety into a functional land use grouping. The classes are a composite

of space design features and actual use considerations. This is reflected in the diversity of criteria, e.g., primary functional use, relation to development values, size of land, urban-rural considerations, intensity, and land characteristics. In general, the resulting system is a well-conceived, internally consistent, and useful method for a classification of open space uses.

UNITED STATES, URBAN RENEWAL ADMINISTRATION - BUREAU OF PUBLIC ROADS. *Standard Land Use Coding Manual*. Washington: Urban Renewal Administration, Housing and Home Finance Agency and Bureau of Public Roads, Department of Commerce, G.P.O., 1965.

This is most widely known and several subsequent attempts have used this manual as a source of reference. The manual is essential reading for an insight into scope and implications of a uniform classification system. It suffers from a close identification with the Standard Industrial Classification system and emphasizes the activity dimension of the establishment, thereby excluding several other essential descriptive land use characteristics. Nonetheless, this is a most relevant piece of work.

VOGT, IVERS AND ASSOCIATES. *Comprehensive Land Use Inventory Report*. Boston: Eastern Massachusetts Regional Planning Project, Department of Commerce and Development, Commonwealth of Massachusetts, March, 1967.

An application of a land use inventory method involving a combination of aerial photography and field survey. "Single homogeneous land use areas" were identified and classified. Vacant land uses were inventoried on the basis of future development possibilities. The grouping system was one of enumeration rather than classification and is complicated by several instances of mixed codes. "Predominant use" criterion is the common basis for area inventory. Problems such as three-dimensionality and mapping inventory scales are treated in the report.

WASHINGTON, METROPOLITAN, COUNCIL OF GOVERNMENTS. *Metropolitan Planning Data From Local Governments*. Washington: Metropolitan Washington Council of Government, Interim Report, July, 1967,

Nine dimensions of land use data were inventoried including activity and type of structure. The basic reference source was the assessment file, with 'activity' being classified following the URA-BPR Manual. A broader land use analysis was provided by a general Land Use Code for parcels and structures.

Land use data was inventoried at three different levels of detail: (1) the parcel, (2) the structures on a parcel, and (3) individual establishments, i.e., different proprietorships on the parcel and/or in the structure.

WEISS, Shirley F. "Land Use Studies." *Principles and Practices of Urban Planning*. Ed. by William I. Goodman and Eric C. Freund. Washington: International City Managers Association, 1968, Chapter 5, 106-136.

This section of the text considers the place of land use studies in urban planning, and the contribution of land use classification to improving the land use data inputs required for the planning process. The author recommends a more detailed system of land use classification. This would widen the range of possible analyses. Because large municipalities have greater land use diversities, and are able to afford facilities and staff for processing data, their adoption of detailed systems is feasible. Smaller municipalities having less variety in uses, may choose to inventory at grosser levels. The URA-BPR is thought to indicate the most desirable approach. For future systems, a further expansion to include data on development potential and descriptions of land data is also recommended.

WILKENS, E. B. *Mapping for Planning: A Procedural Guide for the Classification and Mapping of Land Uses and Related Technical Studies*. Chicago: Publication No. 101, Public Administration Service, 1948.

An attempt is made "to classify each (land) use into a specific functional category" for map representation. There are deficiencies in the structuring of classes, in precision of definition, in the emergence of hybrids, and in sufficient attention to transportation, parks, and recreation.

WOOTEN, Hugh H. *Major Land Uses in the United States*. Washington: Technical Bulletin No. 1082, Department of Agriculture, October, 1953.

On the basis of four major classes, i.e., cropland, grassland, forest, and special (later subdivided into sub-types) an inventory of agricultural land in the United States is made. Detailed classifications attempt to arrive at changing acreages over time.

YAKIMA, DEPARTMENT OF PLANNING AND COMMUNITY DEVELOPMENT. *Land Use Coding Manual*. Yakima: Department of Planning and Community Development, December, 1969.

The development of a land use classification manual for Yakima, Washington, is patterned after the URA-BPR and the Oregon State models. Nine major classes were created which were subsequently developed to three digits. The system is referenced to both a numerical and a colour code. In general, the manual repeats many of the errors of the two parent systems in addition to creating some of its own. These are mainly due to instances of hybrid or mixed criteria coding.

